

Original Research Article

Glycemic control and coping with stress in type 2 diabetes patients

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ABSTRACT

Background: The purpose of the study is finding out how the “style of coping with stress” in type 2 diabetes patients is influenced by glycemic control.

Methods: The study was conducted in cross-sectional design and conducted on 182 Type 2 Diabetes patients who applied to the endocrinology department of a university hospital. The Coping Styles Inventory (CSI) was used in the study. The t Test, One-Way Anova, Mann Whitney U and Kruskal Wallis Testes were used in the analyses.

Results: The problem oriented style point median of the patients according to gender were 29 (15-46) in women, and 31 (14-48) in men ($p < 0.05$); the emotion oriented style median values were 24 (5-40) in women, and 21 (4-35) in men ($p < 0.05$). The submissive styles sub-scale point median according to the educational levels of the participants was found to be significantly higher in the illiterate and primary school graduate group when compared with the others ($p < 0.05$). A reverse-proportional relation was found between the use of self confident style sub-scale of the patients and the HbA1c levels ($p < 0.05$).

Conclusions: It has been determined in our study that men use the problem oriented style coping with stress behaviors, and women use emotion oriented coping with stress behaviors. As the HbA1c levels of the patients increased, their coping self confident style sub-scale scores of them decrease. Glycemic control of diabetes patients must be ensured regularly in order to enable them to cope with stress.

Keywords: Coping with stress, Type 2 diabetes, Glycemic control, Coping styles inventory

INTRODUCTION

Diabetes is a metabolic disease characterized by hyperglycemia developing as a result of insulin secretion, insulin activity or the defect seen in both. This chronic hyperglycemia in diabetes leads to dysfunction in kidney, eyes, nervous system, blood vessels and heart in particular or organ failure in long term.¹ These complications impair quality of life in patients with diabetes.²

According to World Health Organization; while there were 108 millions of people with diabetes all over the world in 1980, this number has reached to 422 million in

2014. Its prevalence has also been increasing across the world.³ According to The Turkish epidemiology survey of diabetes, hypertension, obesity and endocrine disease (TURDEP-II), incidence of diabetes has reached up to 13.7% in Turkish adult population.⁴

Diabetes being common in the society is an important public health concern because it leads to economic losses, its complications seriously influence life quality of the patient, and it has high morbidity and mortality.^{2,5}

According to data of WHO; 1,9 billions of adult were overweight all across the world in 2014 and 600 million of these people were obese. In 2014, prevalence of adult

obesity was 13% (11% in males, 15% in females) in the world and prevalence of overweight was 39% (38% in males, 40% in females). These rates became doubled when compared to the data of 1980.⁶ Prevalence of obesity has been gradually increasing in Turkey, as well. In TURDEP-I survey, it was reported that prevalence of obesity was 30% in women, 13% in men, and 22.3% in total in Turkey.⁷ As is understood from the rates, prevalence of obesity increases likewise diabetes. Obesity, particularly abdominal obesity, increases the risk of diabetes.⁸

Fasting blood glucose, postprandial blood glucose and hemoglobin A1c (HbA1c) follow up are important in following the diabetic patient.⁹ HbA1c is an important test used for glycemic control of patients with diabetes. HbA1c level reflects blood glucose level of patient within the last 2-3 months. It is likely evaluated as an indicator for the development and progress of microvascular complications of diabetes. In diabetic patients, HbA1c of 4-6% signifies very well control; HbA1c of 6.5-7.5% acceptable control; HbA1c of 7.5% and higher poor control.¹⁰

Stress is a condition initiated by a change in the environment and perceived as a threat, struggle or damage for dynamic balance state of individual.¹¹ When a stressful event defined in various manners occurs, it leads to deterioration of the state of balance in individual. If there were balancing factors consisting of perceiving events realistically, sufficient situational support, and adequate coping mechanisms, crisis is prevented by regaining the balance. However, if one or more of these balancing factors do not exist, the problem cannot be solved and the crisis may occur.¹²

Diabetes is a complex and chronic disease leading to severe psychological stress in addition to daily life stress such as life events and occupational stress. Furthermore, diabetes is a stress factor because it forces individual to change and adapt. Individual has to reorganize nutrition program and follow up medication times and dates of doctor visits. If insulin treatment has been started, he/she has to get used to use injections regularly. All these require change and adaptation in individual's life.¹³

Coping methods were classified in two categories as problem-focused and emotion-focused.¹⁴ Problem-focused coping includes opinions and behaviors used by individual to change, solve, and manage the problem causing stress. Emotion-focused coping is aimed at regulating emotional responses to problem.¹⁵

Event-related evaluation of individual is important to choose coping method. If an event is assessed as changeable, problem-focused coping is used; if it is considered as unsuitable to be changed but needs to be tolerated, emotion-focused coping methods are used.¹⁶

According to the description by World Health Organization (WHO), "health is not only the absence of a

disease or disability, but also living in complete peace and well-being physically, mentally, and socially." Therefore, pathophysiology, diagnosis, treatment, and complications of diabetes need to be examined as well as its effects on mental health and social relations of the patient. In the present study, the answer was sought for the question "how does the disease of patients influence their styles of coping with stress?"

METHODS

This descriptive and cross sectional study was conducted with patients type 2 diabetes who applied endocrinology department of a university hospital outpatient clinic in January and February 2016. In order to conduct the study, written consent was received from Scientific Research and Publication Ethics Committee and Department of Internal Disease, Endocrinology discipline. The sample of the study was calculated by using sample formula with the unknown population. Because incidence of diabetes was 13.7% in Turkish adult population according to TURDEP-II, p:13.7 and q:86.3 were taken in this formula and the sample size was found as 182.⁷ Voluntary patients with type 2 diabetes who applied to the endocrinology department of a university hospital and were selected in accordance with the inclusion criteria of the study (18 years to be great and type 2 diabetes) were included in the study until reaching this sample size.

After written consent of the patients was obtained, a questionnaire was applied to the patients by using face-to-face interview technique. The questionnaire consisted of two sections. While there were questions about socio-demographic characteristics and diabetes of the patients in its first section, The coping styles inventory (CSI) which was developed by Folkman and Lazarus and involve 30 items and whose Turkish reliability and validity study was conducted by Şahin and Durak, was used in its second section. The questionnaire is 4-point likert type and is scored between 0 and 3. The items 1 and 9 of the questionnaire are reversely scored. CSI consists of five subscales as self-confidence, helpless, optimistic, submissive, and seeking of social support approaches. The scale measures two major styles of coping with stress. These are problem-oriented/effective and emotion-oriented/ineffective styles. Problem-oriented styles are the subscales of seeking of social support, optimistic approach, and self-confident approach; whereas, emotion-oriented styles are the subscales of helpless approach and submissive approach. Self-confident approach includes the items 8-10-14-16-20-23-26, helpless approach includes the items 3-7-11-19-22-25-27-28, optimistic approach includes the items 2-4-6-12-18, submissive approach includes the items 2-4-6-12-18, seeking of social support approach includes the items 1-9-29-30. The score of each subscale is obtained by dividing total score obtained from the relevant subscale into the number of items. The high score obtained from subscale signifies that individual uses that subscale more. Cronbach's Alpha values vary between 0.45 and 0.80 for these five factors.¹⁷

Independent variables of the study were socio-demographic characteristics such as age, gender, educational level as well as disease-related characteristics such as duration of disorder, treatment used, and experienced complications, and blood parameters such as HbA1c, fasting and postprandial blood glucose. Dependent variable was the scores obtained from the CSI.

The data were statistically evaluated by using a packaged software. For data analysis; t test, one way analysis of variance, Mann Whitney U and Kruskal-Wallis (post-hoc Bonferroni correction) were used. $P < 0.05$ was accepted to be significant in all assessments.

RESULTS

Table 1: Distribution of the patients according to their socio-demographic characteristics.

Socio-demographic characteristics	N	%
Age		
≤49	48	26.4
50-59	73	40.1
≥60	61	33.5
Gender		
Male	99	54.4
Female	83	45.6
Marital Status		
Married	164	90.1
Single	4	2.2
Other	14	7.7
Educational level		
Illiterate	29	15.9
Literate	11	6.0
Primary School	71	39.0
Secondary School	22	12.1
High School	26	14.3
University	23	12.6
Profession		
Worker	10	5.5
Housewife	76	41.8
Retired	55	30.2
Civil servant	13	7.1
Self-employed	23	12.6
Unemployed	5	2.7
Income		
<1000 TL	48	26.4
1000-2000 TL	82	45.1
>2000 TL	52	28.6
Total	182	100

When socio-demographic characteristics of the patients were examined, it was determined that average age of the patients participating in the present study was 54.85 ± 9.05 (min-max: 31-77). 54.4% of the patients were female.

While 21.9% of the patients was literate or illiterate, 39% were primary school graduate, 12.1% were secondary school graduate, 14.3% were high school graduate, and 12.6% were university graduate. 30.2% of the individuals were retired; whereas, 41.8% were housewife. In addition, 26.4% had an average monthly income lower than 1000 TL, 45.1% between 1000 and 2000 TL, and 28.6% higher than 2000 TL (Table 1).

Table 2: Distribution of some diabetes-related characteristics of the patients.

Characteristics	N	%
DM history in family		
Yes	122	67.0
No	60	33.0
Duration of disease		
≤10 years	98	30.6
11-19 years	148	46.3
≥20 years	74	23.1
Treatment used		
Oral anti-diabetic(OAD)	92	50.5
Insulin	36	19.8
OAD+Insulin	48	26.4
No medication	6	3.3
Frequency of going to the control		
When become ill	55	30.2
Monthly	13	7.1
Quarterly	77	42.3
Semiannually	17	9.3
Annually	20	11.0
Smoking		
Yes	37	20.3
No	140	76.9
Sometimes	5	2.7
Existence of psychiatric disorder		
Yes	28	15.4
No	154	84.6
Total	182	100

As the diabetes duration of the patients was examined; 30.6% were diabetic for 10 years and less, 46.3% for 11-19 years, and 23.3% for 20 years and longer. 67% of the patients had diabetes history in their families (mother, father, siblings). Treatments used by patients were as follows; oral anti-diabetic (50.5%), insulin (19.8%), insulin and oral anti-diabetic (26.4%), and no medication (3.3%). Only 42.3% of the patients were regularly going for control quarterly (Table 2).

When distribution of some blood and measurement parameters of the patients was examined; it was determined that while 74.7% of the patients had a fasting blood glucose of 130 and higher, 85.7% had a postprandial blood glucose of 160 and higher. HbA1c values indicating quarterly mean blood glucose level were 7 and lower in 26.4%, 7-8 in 20.9%, 8-9 for 13.2%, and higher than 9 for 39.6% (Table 3).

Table 3: Distribution of fasting-postprandial blood glucose, HbA1c, and body mass index values of the patients.

	n	%
FBG		
<130	46	25.3
≥130	136	74.7
PBG		
<160	26	14.3
≥160	156	85.7
HbA1c		
7≥	48	26.4
7.01-8	38	20.9
8.01-9	24	13.2
9<	72	39.6
BMI		
<18.5	20	11.0
18.5-24.9	70	38.5
25-29.9	77	42.3
30≤	15	8.2
Total	182	100

CSI mean scores of the patients were given in terms of some characteristics. When helpless approach mean scores of the patients were compared in terms of age, it was found that the women's mean score was 1.72 ± 0.57 and men's mean score was 1.49 ± 0.55 ($p < 0.05$). Their mean scores were examined in terms of educational level; it was observed that mean score was 1.95 ± 0.49 in illiterate patients, 1.92 ± 0.44 in literate patients, 1.64 ± 0.51 in primary school graduates, 1.43 ± 0.63 in secondary school graduates, 1.32 ± 0.62 in high school graduates, and 1.38 ± 0.53 in university graduates ($p < 0.05$). When helpless approach mean scores of the patients were examined in terms of by income level, it was determined that they were 1.86 ± 0.50 in patients with an income lower than 1000 TL, 1.58 ± 0.55 in patients with an income of 1000-2000 TL, and 1.38 ± 0.58 in patients with an income higher than 2000 TL ($p < 0.05$). When scores of the patients were examined in terms of duration of diabetes, it was determined that they were 1.51 ± 0.53 in those suffering from diabetes for 10 years and less, 1.71 ± 0.65 in those suffering from diabetes for 11-19 years, and 1.84 ± 0.54 in those suffering from diabetes for 20 years and longer ($p < 0.05$) (Table 4).

Table 4: Comparison of CSI mean scores in terms of some characteristics of the patients.

	Total score		Helpless approach	
	Mean±SD	P value	Mean±SD	P value
Age				
49 and younger	51.66±8.64	0.454**	1.56±0.48	0.518**
50-60	52.47±7.58		1.56±0.65	
60 and older	53.44±5.85		1.67±0.54	
Gender				
Female	53.30±7.23	0.232*	1.72±0.57	0.009*
Male	51.98±7.44		1.49±0.55	
Educational level				
Illiterate	54.20±7.26	0.751**	1.95±0.49	<0.001**
Literate	52.72±5.86		1.92±0.44	
Primary School	52.29±6.77		1.64±0.51	
Secondary School	51.31±9.33		1.43±0.63	
High School	53.30±5.91		1.32±0.62	
University	51.78±9.34		1.38±0.53	
Level of Income				
<1000 TL	53.06±5.15	0.618**	1.86±0.50	<0.001**
1000-2000 TL	52.84±7.65		1.58±0.55	
>2000 TL	51.75±8.58		1.38±0.58	
Profession				
Worker	56.30±4.62	0.307**	1.46±0.60	0.019**
Housewife	52.90±6.98		1.76±0.56	
Retired	52.76±7.80		1.46±0.55	
Civil servant	49.15±9.91		1.39±0.63	
Self employed	51.65±6.97		1.48±0.43	
Unemployed	51.60±4.15		1.82±0.80	
DM History in Family				
Yes	53.22±7.27	0.098*	1.63±0.61	0.299*
No	51.30±7.42		1.54±0.49	

	Total score		Helpless approach	
	Mean±SD	P value	Mean±SD	P value
Duration of DM				
≤10 years	52.57±7.77	0.844**	1.51±0.53	0.014**
10-20 years	52.16±6.22		1.71±0.65	
≥20 years	53.29±7.06		1.84±0.54	

*Student T Test; **One Way ANOVA.

Table 5: Comparison of CSI score medians in terms of some characteristics of patients.

	Problem-oriented style		Emotion-oriented style	
	Median (Min-Max)	Level of significance (p)	Median (Min-Max)	Level of significance (p)
Age				
49 and younger	30 (15-48)	0.987**	21.5 (10-32)	0.229**
50-60	30 (14-46)		21 (4-40)	
60 and older	31 (15-42)		23 (12-35)	
Gender				
Female	29 (15-46) ^a	0.034*	24 (5-40) ^a	<0.001*
Male	31 (14-48) ^b		21 (4-35) ^b	
Educational level				
Illiterate	28 (15-40) ^a	0.001**	27.5 (14-40) ^a	<0.001**
Literate	27 (24-37)		24 (16-31)	
Primary school	30 (18-45)		22 (8-37) ^b	
Secondary school	31 (20-48)		19.5 (5-32) ^b	
High school	37 (14-46) ^b		19 (8-35) ^b	
University	31 (19-45) ^b		18 (4-33) ^b	
Income Level				
<1000 TL	28.5 (14-38) ^a	0.003**	24 (12-40) ^a	<0.001**
1000-2000 TL	31 (15-45) ^b		21 (5-37) ^b	
>2000 TL	31.5 (15-48) ^b		20 (4-33) ^b	
Profession				
Worker	34.5 (28-40)	0.008**	21.5 (12-29)	0.004**
Housewife	29 (15-48) ^a		24 (5-40) ^a	
Retired	31 (14-46) ^b		21 (8-35) ^b	
Civil servant	31 (19-41)		20 (4-33)	
Self-employed	31 (18-48)		20 (10-27) ^a	
Unemployed	29 (24-36)		24 (12-31)	
DM History in family				
Yes	31 (14-48)	0.387*	22 (4-40)	0.216*
No	29.5 (15-46)		21 (4-32)	
Existence of psychiatric disorder				
Yes	28.5(15-41) ^a	0.018*	23(10-35)	0.509*
No	31(14-48) ^b		22(4-40)	
Duration of Having DM				
≤10 years	31(15-48)	0.071**	21(4-40)	0.028**
10-20 years	29(14-44)		23(4-35)	
≥20 years	30(15-41)		24(13-37)	

*Mann Whitney-U Test**Kruskal Wallis Test; a different from b.

When medians of the patients' problem-oriented and emotion-oriented style scores were examined; problem-oriented style score medians were 29 (15-46) in women and 31 (14-48) in men ($p<0.05$). Medians of emotion-oriented style were 24 (5-40) in women and 21 (4-35) in men ($p<0.05$). When score medians of emotion-oriented

style were examined in terms of educational level, it was determined that they were 27.5 (14-40) in illiterate patients, 24 (16-31) in literate patients, 22 (8-37) in primary school graduates, 19.5 (5-32) in secondary school graduates, 19 (8-35) in high school graduates, and 18 (4-33) in university graduates ($p<0.05$). Score medians

of emotion-oriented style were 21 (4-40) in patients having a diabetes duration of 10 years and less, 23 (4-35) in patients having a diabetes duration of 11-19 years, and 24 (13-37) in patients having a diabetes duration of 20 years and longer ($p<0.05$). When score medians of problem-oriented style were examined in terms of additional psychiatric disorder, they were 28.5 (15-41) in those with psychiatric disorder and 31 (14-48) in those with no psychiatric disorder ($p<0.05$).

According to comparison of patients' CSI score medians in terms of HbA1c levels; score medians of self-confident approach subscale in terms of HbA1c level were 2.14 (1-3) in those with 7 and lower, 2.35 (1.29-3) in those between 7 and 8, 2.0 (0.71-2.86) in those between 8 and 9 and 2.0 (0.71-3) in those with 9 and higher ($p<0.05$) (Table 6).

Table 6: Comparison of patients' CSI score medians in terms of HbA1c levels.

Self-confident approach		
	Median (Min-Max)	Level of significance (p)
HbA1c		
≤7	2.14 (1.00-3.00) ^a	
7.01-8	2.35 (1.29-3.00) ^a	0.003**
8.01-9	2.00 (0.71-2.86) ^b	
>9	2.00 (0.71-3.00) ^b	

**Kruskal Wallis; a different from b.

DISCUSSION

Even though CSI mean scores of female patients were found to be significantly higher than mean scores of male patients in the present study, the difference between them was not statistically significant. In the study conducted by Kumcagız et al, to investigate anxiety levels and stress coping status of patients with type 2 diabetes, The CSI and its subscales did not show any significant difference between female and male patients.¹⁸ This result supports the present study. This result concluded that gender had no effect on coping with stress for study group of the present study.

In the present study, emotion oriented style score medians of women and problem oriented style score medians of men were found to be statistically significantly higher. In other words, while women used emotion oriented style more to cope with stress; men adopted problem oriented style. Concerning stress coping styles, there are studies frequently reporting that women applied to passive stress coping methods more than men in the literature.¹⁹⁻²¹

In the study by Utucu et al, women were also indicated to use helpless approach, which is a emotion oriented coping style, more frequently.²² All of these results support the result of the present study and it was thought that this was caused by the fact that women were more submissive and less self-confident for coping with stress and also women in study group of the present study were mostly housewife, did not have economic freedom and they were dependent on their spouses in this sense. Among both adults and students, women adopted emotion oriented styles more in coping with stress.^{23,24}

Helpless approach mean scores of patients participating in the study decreased in a statistically significant manner

as their educational level increased. The study conducted by Akin et al, on patients with type 2 diabetes revealed that patients with higher educational level displayed emotion oriented styles such as helpless approach and submissive approach at lower rate.²⁵ In a study conducted by Celik et al, on diabetic patients, diabetic patients with low educational level were found to have stress coping approaches at lower rate.²⁶ All of these results support the present study and as educational level of the patients increased, emotion oriented style was used lesser in coping with stress.

Helpless approach mean scores of the patients decreased significantly as their level of income increased. In the study by Fadillioglu et al, mean scores of helpless approach style increased with increasing economic income.²⁷ In their study, Eden et al, found that mean scores of seeking of social support among subscales of The CSI were higher in patients with insufficient economic status.²⁸ This result of the present study showed that patients with lower income adopted helpless and submissive approaches more in coping with stress and this is an expected situation.

As disease duration of the individuals participating in the study increased, score medians of emotion oriented style used for coping with stress also increased. A previous study found that helpless and submissive approach mean scores of patients with type 2 diabetes for 11 years and longer were statistically significantly higher.²⁵ In another study, submissive approach scores of patients having a disease duration of 10 years and longer were determined to be higher compared to the other patients.²⁶ All of these results support the result of the present study. As duration of disease increased, individuals passed from problem oriented style to emotion oriented style and this situation was thought to be associated with the disease burden increasing in the course of time.

Problem oriented style mean scores of individuals with a psychiatric disorder were found to be significantly lower. In a study comparing depressed patients receiving outpatient treatment and other groups in Canada, the group with depression was observed to significantly use emotion oriented styles.²⁹ In a study conducted in Korea, it was reported that as depression scores of students decreased, the rate of using problem oriented coping styles increased.³⁰ Having a psychiatric disorder can be interpreted to negatively influence styles of individuals to consult for social support, optimistic approach, and self-confident approach.

Comparison of CSI score medians according to HbA1c levels of patients revealed that while the patients with HbA1c level of ≤ 8 adopted and used self-confident approach styles more, patients with HbA1c level > 8 used self-confident approach less in coping with stress. Because the subscale of self-confident approach was evaluated under problem oriented style in coping with stress, it can be asserted indirectly that patients with better glycemic control used problem oriented style more for coping with stress. In studies on methods of coping with stress in diabetic patients in the literature it is found that while problem-oriented method is associated with slower progress in clinical course of diabetes, emotion oriented style or emotion-oriented method is associated with bad metabolic control.^{31,32}

CONCLUSION

Consequently, patients' styles of coping with stress were affected by educational level, monthly income, duration of disease, and status of having a psychiatric disorder, the gender did not influence this situation. Furthermore, diabetic patients with poor control adopted self-confident approach at lower rate.

Diabetes having high mortality and morbidity, being frequently seen in society and influencing quality of life seriously should be approached multidisciplinary. Psychological support is important for patients to more easily cope with the problems experienced during their lives. Blood glucose controls are not only required for body health but also mental health, especially for patients who are diabetic for a long time. Therefore, they should be ensured to come for the control regularly, take their medications correctly and attention to their diets and relevant consultancy services should also be increased for the patients. Individuals with psychiatric disorder in addition to diabetes need to be assessed specially. In this context, the cooperation of endocrinology and psychiatry sciences is very important for health conditions of the patients.

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